| Rheology Study of $Py_{60}Mj_{40}$ Garnet at High Pressure and High Temperature | X17B1 |
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*In situ* X-ray diffraction measurements of the rheological properties of $Py_{60}Mj_{40}$ garnet was completed up to 16GPa and 1000°C at the X-17B1 beam line using the newly designed high pressure apparatus T-cup[1]. The powder $Py_{60}Mj_{40}$ garnet was first compressed to 16GPa and heated up gradually to 1000°C. By analysing the peak broadening for the (400) diffraction, we get the microscopic strains of the sample.

Our result shows that the garnet sample reached yield point less than 6GPa at room temperature. This is quite consistent with our earlier results[2]. Then the strength increased slowly with the increasing pressure. Under 16GPa confining pressure, we increased the temperature gradually, first to 400°C, 620°C, then 800°C, and finally to 1000°C. The microscopic strain decreased noticeably with the increasing temperatures. Around 1000°C, the strain decreased almost to zero. At the specific temperature, we can see the microstrain decreased monotonically with time. And there is a linear relationship between $\log(\varepsilon)$ and $\log(t)$. And the slope of the $\log(\varepsilon)$ *vs* $\log(t)$ indicates that the exponent $n$ of the power-law relationship decreases from 50 at 400°C to about 10 around 810°C. This suggests the $Py_{60}Mj_{40}$ garnet may still be in the plastic regime at 800°C. Also, the strain rate in the order of $10^{-6}$ $s^{-1}$ was measured for these temperature ranges.

References:
[1]Weidner, NSLS Activity Report, B-140 (1995);
[2]Wu, NSLS Activity Report, B-141 (1995).

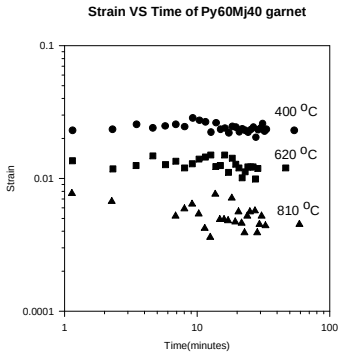


Figure 1. Strain in $Py_{60}Mj_{40}$ garnet as a function of time.